

CLAIMS

What is claimed is:

1. A process comprising:
  - a. forming a donor element comprising:
    - i. a substrate; and
    - ii. a transfer layer, wherein the transfer layer comprises a fragile or thermally sensitive material and a protective layer located between the substrate and the fragile or thermally-sensitive layer;
  - b. placing the transfer layer of the donor element in contact with a receiver element; and
  - c. exposing selected areas of the donor element to laser radiation to transfer portions of the transfer layer onto a receiver element to form a positively imaged, patterned multilayer structure.
2. The process of Claim 1, wherein the donor element further comprises an ejection layer between the transfer layer and the substrate.
3. The process of Claim 2, wherein the ejection layer comprises an organic material with a decomposition temperature less than 275 °C.
4. The process of Claim 3, wherein the ejection layer is selected from the group consisting of nitrocellulose, polyvinylchloride, chlorinated polyvinylchloride, polymethylmethacrylate and polymethylmethacrylate copolymers
5. The process of Claim 2, wherein the ejection layer further comprises a radiation-absorbing dye.
6. The process of Claim 5, wherein the radiation absorbing dye is an infrared-absorbing dye.
7. The process of Claim 6, wherein the infrared-absorbing dye is selected from the group consisting of 2-[2-[2-chloro-3-[(1,3-dihydro-1,3,3-trimethyl-2H-indol-2-ylidene)ethylidene]-1-cyclopenten-1-yl]ethenyl]-1,3,3-trimethyl-3H-indolium, salt with trifluoromethane sulfonic acid (1:1); 2-[2-[2-chloro-3-[[1,3-dihydro-1,1-dimethyl-3-(4-sulfobutyl)-2H-benz[e]indol-2-ylidene]ethylidene]-1-cyclohexen-1-yl]ethenyl]-1,1-dimethyl-3-(4-sulfobutyl)-1H-benz[e]indolium, inner salt, free acid; and 4-[[3-[[2,6-bis(1,1-dimethylethyl)-4H-thiopyran-4-ylidene]methyl]-2-hydroxy-4-oxo-2-cyclobuten-1-ylidene]methyl]-2,6-bis(1,1-dimethylethyl)-thiopyrylium, inner salt.

8. The process of Claim 1, wherein the substrate of the donor element is a flexible film.

9. The process of Claim 8, wherein the flexible film comprises a polymer selected from the group consisting of polyesters, polyether sulfone, polyvinyl chloride, polyimides, poly(vinyl alcohol-co-acetal), polyethylene, and cellulose esters.

10. The process of Claim 1, wherein the fragile or thermally sensitive material comprises an organic electroactive material.

11. The process of Claim 10, wherein the organic electroactive material comprises a light-emitting polymeric material or a light-emitting small molecule, the protective layer comprises a charge injection layer, and the receiver element comprises a substrate and an anode layer.

12. The process of Claim 11, wherein the anode layer comprises indium tin oxide.

13. A polymer light-emitting diode manufactured according to the process of Claim 12.

14. The process of Claim 1, wherein the fragile or thermally sensitive material comprises an organic or inorganic semiconductor and the protective layer comprises a dielectric material.

15. The process of Claim 14, wherein the organic semiconductor is selected from the group consisting of pentacene, sexithiophene, tetracene, polythienylenevinylene, thiophene oligomers, benzothiophene dimers and polyacetylenes.

16. The process of Claim 14, wherein the dielectric material is selected from the group consisting of polyhydroxystyrene, polyvinylphenol, polyvinylpyridine, glass resin, fluorinated copolymers and methacrylic copolymers.

17. The process of Claim 14, wherein the receiver element comprises a substrate and a patterned conductive layer.

18. The process of Claim 17, wherein the substrate of the receiver element comprises mineral-filled polyester, ivory paper or spunbonded polyolefin.

19. The process of Claim 14, wherein the receiver element further comprises an adhesive layer.

20. The process of Claim 19, wherein the adhesive layer comprises a polymer selected from the group consisting of polycarbonates; polyurethanes; polyesters; polyvinylchloride; styrene/acrylonitrile

copolymers; poly(caprolactone); vinylacetate copolymers with at least one of ethylene and vinyl chloride; (meth)acrylate homopolymers; (meth)acrylate copolymers; and mixtures thereof.

5        21. The process of Claim 14, wherein the donor element further comprises an ejection layer between the transfer layer and the substrate.

22. The process of Claim 14, wherein the donor element further comprises a heating layer between the substrate and the transfer layer.

23. The process of Claim 22, wherein the heating layer comprises a thin layer of Ni, Al or Cr.

10        24. The process of Claim 17, wherein the patterned conductive layer comprises source and drain for a transistor.

25. The process of Claim 24, wherein the patterned conductive layer further comprises interconnects.

26. A thermally imageable donor element, comprising:

- 15        a. a substrate;  
b. a heating layer;  
c. a protective layer; and  
d. a fragile or thermally sensitive layer.

20        27. The thermally imageable donor element of Claim 26, wherein; the substrate is a flexible film comprising a polymer selected from the group consisting of polyesters, polyether sulfone, polyvinyl chloride, polyimides, poly(vinyl alcohol-co-acetal), polyethylene, and cellulose esters;

25        the heating layer comprises a thin layer of Ni, Al, or Cr;  
the protective layer comprises a dielectric material or a charge injection material; and  
the fragile or thermally sensitive layer comprises an organic semiconductor, or a light-emitting polymer, or a light-emitting small molecule.

30        28. The donor element of Claim 27, wherein the fragile or thermally-sensitive layer is deposited on the protective layer via evaporation or casting from solution.